FINAL WORK PLAN
REMEDIAL DESIGN ACTIVITIES
FOR THE SOIL REMEDIATION
AT THE CURRICULUM CENTER
TUTU WELLS SITE
ST. THOMAS, USVI

Volume I

April 22, 1998

EPA CONTRACT NO.: 68-W9-0024
WORK ASSIGNMENT NO.: 089-2R1D
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REMEDIAL DESIGN ACTIVITIES
AT SELECTED UNCONTROLLED
HAZARDOUS SUBSTANCE DISPOSAL SITES
IN REGION II
(ARCS II)

U.S. EPA CONTRACT NO.: 68-W9-0024

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Remedial Design Activities
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at the Curriculum Center

Tutu Wells Site
St. Thomas, U.S.V.I.

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1.0 GENERAL

1.1 INTRODUCTION

CDM Federal received Work Assignment 089-2R1D from EPA to provide remedial design services for soil remediation at the Curriculum Center at the Tutu Wells Site in St. Thomas, U.S. Virgin Islands.

The Curriculum Center has been identified as a source of volatile organic compound (VOC) contamination to groundwater at the Tutu Wells Site. The principal contaminant source material is believed to exist as dense non-aqueous phase liquids (DNAPL) in the fractured bedrock adjacent to and beneath the building. The purpose of this remedial design (RD) is to design a remedy for the soils and unsaturated bedrock at Curriculum Center as documented in the EPA's Record of Decision (ROD) dated August 5, 1996. CDM Federal will conduct the RD in accordance EPA's Remedial Design/Remedial Action Handbook, dated June 1995, the EPA Guidance on Expediting Remedial Design Remedial Action dated August 1990 and other appropriate guidance. The objective of the design will be the generation of performance-based specifications for the remedial action.

1.2 BACKGROUND

The information below briefly summarizes the characteristics of the site that are relevant to the design of the soils remedy at the Curriculum Center. For greater detail concerning the physical characteristics, the demographics, site history, and nature and extent of contamination, please refer to the Remedial Investigation report (Geraghty and Miller, Inc. 1995), the Arthur D. Little (ADL) report (1994) and other site characterization documents.

1.2.1 Description of Site

The Tutu Wells Site is located at the eastern end in the Anna's Retreat Section of St. Thomas, within the upper Turpentine Run surface drainage basin. The basin, which covers approximately 2.3 square miles, trends roughly north-south and is bounded by the steep slopes of the surrounding hills. Adjacent valleys trend northeast-southwest or northwest-southeast. Paved two-lane roads (Route 384, Route 38, and Highway 382) run down the valley axes. These roads are lined by a variety of commercial establishments, schools, and churches. Private homes and multi-family housing units line the less heavily traveled side roads. According to the 1990 U.S. Census Bureau data, approximately 9,100 people live in Anna's Retreat (also known as the Tutu Subdistrict of St. Thomas). This represents approximately 20 percent of the island's population.

The Tutu Wells Site is underlain by moderately weathered, fractured volcaniclastic rocks that form a significant unconfined aquifer, hereafter called the Turpentine Run Aquifer, which supports a number of private and commercial water supply wells. This aquifer was previously the largest fresh water supply on the island. However, since 1987, many of the public and private supply wells within the Tutu Wells site have been closed due to contamination.

The Curriculum Center is located on Route 38 at the northwest end of the Tutu Wells site (Figure 1). It is situated on a bedrock hill, uphill and upgradient from the Texaco Tutu Service Station and Tillet Gardens. Rock cores collected during the RI revealed the geologic units beneath the site consist of volcanic breccia and debris flow. A thin veneer of unconsolidated surface soils, approximately 2-4 feet thick overlies the bedrock. These have been graded and reworked. Based on water level data from 1992 and 1994, the water table beneath the site fluctuates from about 25-40 feet below ground surface.

The facility, which is currently owned by the VI Department of Education and operated as a vocational training school known as the "Curriculum Center", was formerly owned and operated as a textile manufacturing facility by LAGA Industries Ltd.

1.2.2 Tutu Wells Site History

On or about July 7, 1987, Mr. Eric Tillet contacted the Department of Planning and Natural Resources (DPNR) regarding an odor emanating from the raw well water on his property located at Anna's Retreat.

On July 16, 1987, EPA received a request from the DPNR in St. Thomas, for sampling and analysis of several wells in the Tutu area. On July 21, 1987, EPA and its Technical Assistance Team (TAT) contractor, Roy F. Weston, Inc., mobilized to St. Thomas to sample the drinking water wells suspected of being contaminated. The test results showed the presence of high concentrations of gasoline and chlorinated organic compounds. Seven wells (Eglin, Four Winds, Harthman, and Virgin Islands Housing Authority) were closed down by order of the DPNR due to high VOC concentrations.

Several of the wells in this area are large commercial wells used for public drinking water supply; therefore, the incident was classified as major, and the DPNR Commissioner requested EPA to assume the role of lead agency.

Sampling of cisterns served by the contaminated wells was also performed. EPA directed the Emergency Response Cleanup Services (ERCS) contractor to clean and disinfect the five (5) cisterns which had tested positive for tetrachloroethene (PCE), modify the existing home plumbing, disconnect the contaminated wells, and dispose of the contaminated water. At EPA's direction, the ERCS contractor also contracted with a local water hauler to deliver uncontaminated drinking water to the cisterns by tank truck. A well sampling program was established by EPA to monitor the wells at the Tutu Site.

A Hazard Ranking System Package was prepared and the Site was proposed to the National Priorities List (NPL) in February 1992. It was listed on the NPL on September 29, 1995.

The Remedial Investigation/Feasibility Study of the site soils and groundwater was performed by the Tutu Environmental Investigation Committee (TEIC), consisting of Texaco Caribbean, Inc. (Texaco) and Esso Standard Oil, U.S.A., Inc. (Esso). The results of these investigations are presented in Technical Memorandum I (Geraghty and Miller, April 1992), technical Memorandum

II (Geraghty and Miller, May 1993), Final Phase II Remedial Investigation Report (Geraghty and Miller, April 1995), and the Draft Final Feasibility Study (Geraghty and Miller, August 1995). The RI/FS work documented the existence of two petroleum-related groundwater contaminant plumes and several chlorinated VOC plumes in the Turpentine Run Aquifer (Figure 2).

The RI identified the Curriculum Center as the source of the northern VOC plume. Based on the concentrations of VOCs in groundwater adjacent to and downgradient from the Curriculum Center, the property was identified as a probable area of DNAPL contamination in the subsurface, either above or below the water table.

The Record of Decision (ROD) was signed on August 5, 1996. The ROD calls for area-wide plume/source containment and treatment of contaminated groundwater. The Tutu Wells site is to be remediated by integrating the remediation of six source areas (primarily soils contamination) with the recovery and treatment of the area wide groundwater plume of contamination. This plume is the result of the commingling of contaminant releases from the various source areas, of which the Curriculum Center is one.

The individual source areas will be addressed by a combination of in-situ and ex-situ soil vapor extraction and disposal of contaminated soils. The location of the Curriculum Center source area with respect to the Tutu Wells site is shown in Figure 1.

1.2.3 History of Operations at the Curriculum Center

According to Arthur D. Little Inc.'s 1994 report, the LAGA building was constructed sometime in 1970 for LAGA Industries Ltd. The LAGA Industries textile operation began production in 1971, producing wool and polyester knit blend cloth. The primary operations were knitting, pressing patterns, and receiving/shipping. All polyester knit blend cloth and wool cloth was dry-cleaned at the facility. Operations at LAGA ceased about 1978 and the property was subsequently sold to Panex Co. in 1979. The building was vacated in about 1982, at which time the USVI Department of Education renovated the building and later occupied it.

No records could be found to determine the type and quantity of dry cleaning solvents used at the site by LAGA. However, according to the Center of Emissions Control (1993), tetrachloroethene, also known as PCE, is the most common chemical used in industrial dry-cleaning. Trichloroethene (TCE) and trichloroethane (TCA) have also been used by the industry, but much less frequently.

There have been testimony by former LAGA employees (Smith and Richards) that spent PCE and cooker residue from the dry cleaner process were disposed in a pit located outdoors to the north of the building. However, the accuracy of this testimony was questioned by LAGA after re-interviewing the employees and based on the fact that no "pit" was located during the remedial investigations.

Although the vast majority of solvent is recovered as part of the dry cleaning process, there are aqueous, solid and vapor waste streams produced as part of the process. The recovery of solvent vapors from dry cleaning operations results in contamination of the solvent with small quantities of water. Before the solvent is reused, the solvent is routed to a water separator. This water typically

contains concentrations of the solvent at its solubility limits and is discharged as wastewater. According to the Center for Emissions Control (1993), a properly operating solvent recovery system releases approximately 50 to 1500 gallons of water per year containing 1 to 150 ppm of PCE to the wastewater disposal system. Poorly operated systems potentially discharge much greater quantities. Assuming a properly operating system, Arthur D. Little Inc. (1994) estimated releases in the aqueous stream to be approximately 0.01 lbs/day of pure solvent. Over 8 years of operation, this would equate to approximately 29.2 pounds of pure solvent. ADL also estimated that approximately 110 tons of sludge were generated during the LAGA operational period. Assuming this sludge contained 2% solvent, the sludge waste stream would have contained another 5500 pounds of solvent.

No records indicate where the aqueous and sludge waste streams were discharged. In the 1970's, it was common practice to discharge to either sanitary sewers or leaching pits. It was not uncommon to find leaching pits in use even where sanitary sewers were available.

During the RI investigation, underground piping that currently contains oil and 30% PCE solvent was discovered by EPA and DPNR beneath the LAGA building. This piping does not appear on the as-built plans provided to EPA. It appears to have been installed after the original flooring, but prior to the current interior wall. In March 1995, EPA was able to trace the piping from the floor drainpipes in a room that apparently held the PCE reclamation still to the former dry cleaning room. There was no evidence of leakage in the section of pipe investigated, however, the full extent of the piping and its integrity remain unknown.

Areas considered in the RI as potential source areas at the LAGA Building/Curriculum Center include a former drum disposal area (northwest of the building), the approximate location of a suspected former discharge pipe (along the center of the north wall of the building) alleged to be associated with dry cleaning operations, a sink that discharges water directly to the outside soils (along the north end of the east wall of the building), floor drains within the building, and the alleged former waste pit (reportedly located in the unpaved area north of the building). Figure 2 shows the area beneath and surrounding the Curriculum Center that was identified during the RI as potentially containing DNAPL product in the subsurface.

1.2.4 Summary of Previous Investigation Results at the Curriculum Center

Soils

During the RI investigations at the Curriculum Center, approximately 3 to 1800 parts per billion (ppb) of PCE were detected in eight samples at the north-central side of the main building in the vicinity of the former discharge pipe and presumed former waste pit. TCE was detected in four samples at concentrations from 1 to 130 ppb. One chlorinated VOC, 1,1,1-TCA was detected above the EPA's soil screening levels (which are conservative soil concentrations calculated to be protective of groundwater). Although no samples were collected from beneath the building, it is suspected that higher concentrations of chlorinated VOCs may be present in the soil beneath the

building or in the unsaturated bedrock. The elevated concentrations of chlorinated VOCs in groundwater adjacent to and immediately downgradient of the Curriculum Center indicate a high probability that pure product (DNAPL) is present in the unsaturated or saturated bedrock.

At the northeast corner of the Curriculum Center, in an area where a drain from the paint shop sink discharged to the ground, benzene, toluene, ethylbenzene and/or xylenes (BTEX) compounds exceeded EPA's soil screening levels in two surface soil samples. The individual BTEX concentrations ranged from benzene at 2,700 ppb to toluene at 500,000 ppb.

Groundwater

The northern chlorinated VOC plume, which originates near the Curriculum Center, extends approximately 1,600 feet south, in the direction of the groundwater flow, to a point just southeast of Four Winds Plaza, and is approximately 500 feet wide. The highest concentrations of total chlorinated VOCs occur in shallow zone monitoring wells, where chlorinated VOC concentrations greater than 1,000 ppb were detected. Concentrations of VOCs in the northern part of the north plume have not decreased with time, nor have the shape or general extent of VOC contamination changed in this area, indicating that the northern chlorinated VOC plume is relatively stable. This stability suggests that there is a continuing source of VOCs to groundwater in the immediate vicinity of the highest groundwater contamination at the Curriculum Center. Concentrations of vinyl chloride and PCE decrease sharply downgradient of the site.

The principal chlorinated VOCs detected in the northern plume are 1,2-dichloroethene (1,2-DCE), PCE, and TCE. Vinyl chloride has also been detected at high concentrations in the northern plume, but its detection was restricted to the immediate vicinity of the Curriculum Center. The maximum concentrations detected in the northern plume during the RI were 1,2-DCE at 2,100 ppb, vinyl chloride at 1,300 ppb, PCE at 360 ppb and TCE at 78 ppb. The Safe Drinking Water Act Maximum Contaminant Levels (MCLs) for drinking water for 1,2-DCE, PCE, TCE and vinyl chloride are 70, 5, 5, and 2 ppb, respectively.

Historically, the concentration of PCE in the Tillet supply well, located downgradient of the Curriculum Center, has been reported up to 2,040 ppb, which exceeds 1 percent of the solubility of PCE. DNAPLs are, therefore, suspected to be present in this vicinity. The maximum concentrations of 1,2-DCE and vinyl chloride also strongly suggest the presence of chlorinated DNAPL in the immediate vicinity of the Curriculum Center.

1.3 OUTLINE OF WORK

The ROD has established the following remedial action objectives (RAOs) for the Tutu Wells Site:

- Remove and/or control sources of groundwater contamination.
- Prevent direct human contact and exposure to contaminated soils that pose excess cancer risks greater than 1 in 10,000 or a hazard index greater than 1.

- Eliminate leaching of contaminants of concern from soils into groundwater at concentrations which adversely impact groundwater quality and which might ultimately have negative ecological effects.

To accomplish these remedial objectives, the ROD selected remedy for the Curriculum Center includes the following components:

- Excavation of impacted soils in the unsaturated zone, followed by either offsite disposal, or ex situ SVE and redepositing of the treated soil onsite;
- In situ SVE treatment in unsaturated bedrock areas and in soil areas not suitable for excavation, to remediate contaminated soils and/or rocks present in the unsaturated zone; and
- Thermal oxidation for SVE off-gas treatment.

At this time, the conceptual remediation system for the Curriculum Center consists of in-situ SVE removal of contaminants from the unsaturated fractured bedrock and the deeper portions of the unconsolidated soils. The contaminants which are collected in the vapor stream will be treated using thermal or catalytic oxidation treatment. During later stages of operation, when contaminant removals are relatively low, it is possible that the vapor or off gas stream will be treated using granular activated carbon canisters.

Shallow soil contamination, particularly that at the surface, is usually not effectively treated with in-situ SVE (an exception to this would be soils beneath the building). Depending on the soil physical properties (i.e. vapor pressure), the chemical properties of the shallow soil contamination, and the biodegradability of those contaminants, these shallow soils can be excavated and either disposed of in a permitted land disposal facility or can be treated onsite using an ex-situ or "soil pile" SVE system. Such a soil pile SVE system would be integrated with the in-situ system. One of the objectives of the predesign investigation is to define the shallow soil contamination and to make a determination on how to proceed with its remediation. It could be addressed by a combination of all the options identified above. A schematic of this conceptual system is shown in Figure 4.

The work to be performed for this assignment falls under two main categories: predesign investigations and design. Additional source delineation is required prior to the installation of the in situ SVE treatment system to provide data pertaining to the design parameters to maximize the effectiveness of the remediation. Prior to designing the SVE system(s), additional information is also needed concerning the potential presence of DNAPL in the subsurface. CDM Federal will perform the following predesign work:

- Hydrogeologic assessment to estimate the extent of DNAPLs in the saturated zone;
- Drill and sample borings to the water table on the exterior of the building to define the area of shallow soil contamination and search for possible DNAPL and VOC sources;
- Perform vacuum tests of packered intervals in the unsaturated zone of the deep borings to monitor extracted vapor flow rate, soil pressure distribution, radius of influence (ROI) and soil gas concentrations;
- Perform wet vacuuming of piping in the Curriculum Center floor to remove product and smoke testing of drains and piping to determine any unknown discharge points;
- Drill and sample shallow borings within the Curriculum Center, boring through the floor to search for DNAPL and VOC sources;
- Perform pilot SVE testing on up to five borings to monitor flow rate, vacuum, and radius of influence; and
- Collect surface soil samples, soil gas samples and groundwater samples to characterize contaminant concentrations;

The above activities will provide the design parameters needed to initiate the design phase of the RD. The design will include:

- Identification of access agreements, easements and permits;
- Preparation of preliminary, pre-final and final design reports;
- Preparation of design construction cost estimate;
- Preparation of performance-based request for proposal (RFP) preliminary, pre-final and final design documents;
- Preparation of preliminary and final monitoring plans;
- Preparation of a draft operations and maintenance manual;
- Provision of post-remedial design negotiation support; and
- Community Relations Support.

Section 2.0 describes in detail the tasks that will be performed for this work assignment. Figure 3 shows the project schedule. Table 1 lists the project deliverables that will be prepared by CDM Federal and gives the schedule for their submittal.

1.4 QUALITY ASSURANCE

All work on this work assignment will be performed in accordance with the following guidance documents:

- Remedial Design/Remedial Action Handbook, USEPA, Office of Emergency and Remedial Response, EPA 540/R-95/059, June 1995;
- Superfund Remedial Design and Remedial Action Guidance, USEPA, Office of Emergency and Remedial Response, OSWER Directive 9355.)-4A, June, 1986;
- Guidance on Expediting Remedial Design and Remedial Action, USEPA, Office of Emergency and Remedial Response, EPA /540/G-90/006, August, 1990;
- EPA Region II CERCLA Quality Assurance Manual, Revision 1, October 1989;
- CDM Federal ARCS Region II QA Management Plan (QAMP), Revision 4, April 19, 1995;
- CDM Federal Programs Corporation Quality Assurance Manual, Revision 8, October 1997;
- CDM Federal Programs Corporation, Design Quality Control Plan, April 2, 1997; and
- CDM Federal Programs Corporation, Project Management Guide, Revision 1, January 1997.

The Regional Quality Assurance Coordinator, or her designee, has reviewed this work plan for quality assurance requirements and will maintain QA oversight for the duration of the work assignment. A Sampling and Analysis Plan is required and will be submitted as part of the Quality Assurance Project Plan (QAPP). This QAPP will be subject to quality assurance review and approval following technical review.

The work assignment manager is responsible for implementing appropriate QC measures on this work assignment. Such QC responsibilities include:

- Implementing the QC requirements referenced in the above guidances;
- Conducting field planning meetings;

- Adhering to the ARMIS document control system; and
- Organizing and maintaining work assignment files.

Technical review requirements in QAMP Section 5 will be followed on this work assignment. QA review requirements in QAMP Section 4.5 will be followed on this work assignment. Prior to conducting field activities, a field planning meeting will be held in accordance with the ARCS II QAMP. Any report presenting measurement data generated by CDM Federal during this work assignment will include a QA section addressing quality of data and its limitations. Such measurement reports will require a QA review following a technical review. An office internal systems audit or a field technical systems audit may be conducted by the CDM Federal QA staff. An audit report will then be prepared and distributed to the audited group, to CDM Federal management and to EPA. EPA may conduct or arrange a system or performance audit. CDM Federal may submit performance audit samples as required for non-RAS analyses.

2.0 TECHNICAL AND MANAGEMENT APPROACH

This section describes in detail the work to be performed for this remedial design. The work breakdown structure provided in EPA's statement of work is followed below.

2.1 TASK 1 - PROJECT PLANNING

This task includes all work efforts related to planning and administering this design project.

2.1.1 SUBTASK 1.1 - Work Plan Preparation

This task includes the project scoping meeting, a site visit, and preparation and negotiation of the draft and final remedial design work plans.

Scoping Meeting - The CDM Federal Work Assignment Manager (WAM) and Program Manager attended a meeting at EPA on October 9, 1997, to discuss the scope and schedule of the work assignment.

Site Visit - Accompanied by the EPA RPM, the project design engineer and project predesign investigation leader visited the site in St. Thomas, USVI to become familiar with site conditions and to initiate discussions with the USVI Department of Natural Resources concerning site access and logistics. Due to schedule constraints, this visit occurred between the submittal of the draft and final work plans.

Draft RD Work Plan Volume I and Volume II (Cost Estimate) - CDM Federal prepared a draft work plan which described in detail the work to be performed during the RD in accordance the Remedial Design/Remedial Action Handbook, dated June 1995, the Guidance on Expediting Remedial Design Remedial Action dated August 1990 and other appropriate guidance. The cost estimate to perform this work was presented in a separate Volume II.

Negotiation and Preparation of Final Work Plan Volume I and II - The CDM Federal WAM, Program Manager, Technical Operations Manager, and Senior Engineer attended a meeting at EPA to negotiate the Work Plan cost estimate. Based on the comments received from EPA, CDM Federal has prepared a Final Work Plan Volume I (this document) and Volume II.

2.1.2 SUBTASK 1.2 - Review Background Documents

The WAM, project design engineer and predesign investigation leader will review relevant background documents and evaluate existing data to develop a conceptual understanding of the site. Documents to be reviewed include the Final RI and FS Reports, EPA's ROD, and other documents

pertaining to site-specific conditions at the Curriculum Center, such as the ADL Report (1994), and documents prepared by other PRPs concerning the soil sources of VOC contamination in the aquifer.

2.1.3 SUBTASK 1.3 - Quality Assurance Project Plan

CDM Federal will prepare several plans to govern the predesign field investigations. These will include a QAPP, a Site Management Plan (SMP), and a Health and Safety Plan (HSP).

Quality Assurance Project Plan - The QAPP will describe the rationale for the field program. It will detail the following:

- Standard operating procedures (SOPs) for field investigations including sampling, monitoring, and field instrument calibration;
- Number, location, and types of samples;
- Parameters to be analyzed and analytical methods to be used;
- Chain-of-custody procedures;
- Sample packaging and shipment procedures;
- Decontamination procedures;
- QA/QC of field sampling and procedures for field changes and corrective action; and
- Responsibilities of site personnel.

The QAPP will be prepared in accordance with EPA Region II requirements. The QAPP requires information such as sample data quality objectives, detection limits, QC procedures related to sampling operations and laboratory testing protocols.

Site Management Plan - The SMP will describe site control procedures, site operations organization, and the corresponding field operations schedule.

The site control section will describe how approval to enter the areas of investigation will be obtained, along with the site security control measures, and the field office/command post for the field investigation. The logistics of all field investigation activities are also described. The site operations section will include a project organization chart and delineate the responsibilities of key field and office team members. The last section will include the predesign RD schedule, showing the proposed scheduling of each major field activity.

Health and Safety Plan - the HSP will specify employee training, protective equipment, medical surveillance requirements, SOPs, and a contingency plan in accordance with 29 CFR 1910.120(l)(l) and (1)(2).

2.1.4 SUBTASK 1.4 - Quality Assurance

Quality assurance activities to be performed during this project include field and technical systems audits, field planning meetings, and quality assurance reviews of all project plans, measurement reports and procurement packages. In addition, a project quality management (PQM) meeting will be held during the early stages of the project to identify critical factors for project success.

2.1.5 SUBTASK 1.5 - Project Administration

The project administration activity involves budget management and tracking, project scheduling and coordination, preparation of technical and financial status reports, and attendance at quarterly ARCS Project Manager meetings. This task also includes the Program Management Office (PMO) activities which consist of internal status/progress meetings, technical and financial reviews of the monthly reports, reviews of deliverables, staffing requirements, document control filing, transfers, and invoices.

2.1.6 SUBTASK 1.6 - Project Closeout

Project close-out includes work efforts related to the project completion and closeout phase. Project records will be consolidated and transferred to EPA. A Work Assignment Closeout Report (WACR) will be completed.

2.2 TASK 2 - PREDESIGN FIELD INVESTIGATION

This task includes work efforts to collect environmental data in support of the RD. Prior investigations of the Curriculum Center identified high concentrations of PCE and vinyl chloride in soil and groundwater at concentrations that indicate the probable presence of DNAPLs at the site. In addition, samples from abandoned pipes in the floor of the Curriculum Center were found to contain a solvent with 30 percent PCE. These facts, in conjunction with known prior dry cleaning operations in the northwest corner of the building, indicate that DNAPLs may exist under the building.

Figure 2 shows the area that G&M identified during the RI/FS as suspected to contain DNAPL in the unsaturated and/or saturated zone beneath the building and in the immediate surrounding area of the Curriculum Center. This 1.5 acre "possible" source area actually includes a number of intermingled contaminant releases, as described in Section 1.2.4. These releases include dilute chlorinated VOC waste streams, chlorinated DNAPLs, and petroleum hydrocarbons.

Prior investigations of the Curriculum Center have been successful in identifying the likely source/release areas and in demonstrating that significant quantities of contamination have been released. The existing data however, are insufficient to define the extent of the contamination, the quantities of unconsolidated soils that require remediation, and the quantities of fractured bedrock

that require remediation. In addition, the physical characteristics of the soil and bedrock need to be determined to properly size the soil vapor extraction system.

The characterization of possible DNAPL in the saturated zone beneath the site is vital to the proper coordination between the nearby Texaco source control system and the area wide groundwater remediation system. Proper control and/or reduction of any source area below the water table is required for the overall Tutu Wells Site remediation program to be effective. The DNAPL characterization in the saturated zone is being performed as part of this soil RD because it is expected to be contained to the Curriculum Center site. This investigation will determine the extent of DNAPL contamination, even offsite if necessary.

The purpose of the predesign field investigation is to:

- refine and more accurately determine the extent of unsaturated zone contamination that requires remediation, in both unconsolidated soils and fractured bedrock;
- determine variations in pneumatic permeability of the unsaturated soils with depth by location;
- determine the expected influent VOC vapor concentrations to an SVE system;
- determine the appropriate flow rate for an SVE system;
- estimate the mass of contamination in the unsaturated soil zone and estimate the period of operation for a SVE system;
- generate a pre-remediation database for comparison with post remedial sampling results to evaluate the effectiveness of the remedial action; and
- estimate the extent of DNAPLs in the saturated zone on the sub-site and, if necessary, make recommendations for integrated remediation with the other source control operations and the Tutu Wells Site sitewide groundwater remediation system.

The estimates of the number and depth of borings to be performed under this work assignment were made for costing, scheduling and planning purposes. An inside-out approach will be used for locating borings, and field modifications will be made accordingly (in consultation with EPA) based on the field observations and screening data. However, the total drilling footage and number of samples is not expected to exceed the quantities stated in the work plan for this assignment.

2.2.1 SUBTASK 2.1 Site Reconnaissance

CDM Federal will perform a site reconnaissance to assess current building and site conditions and to arrange site access and field logistics prior to beginning the sampling program. During the site reconnaissance, preliminary sampling points will be established in the field based on the data gaps identified during the preparation of the FS and this work plan. Locations may be modified somewhat during the field program to avoid underground utilities and overhead power. In addition, during the site reconnaissance, an attempt will be made to trace subfloor piping and floor drains at the facility using smoke tests. The objective will be to determine any unknown discharge points.

The presence of 30 percent PCE in subfloor piping represents a possible subsurface contamination source. It also presents a possible risk of accidental contamination release during the subfloor drilling program inside the building. Since a reliable as-built drawing of subfloor piping is not available, there is a risk that drilling through the floor could rupture one of these pipes. Therefore, wet vacuuming of the piping will be performed before the smoke testing and before any drilling through the floor. This action will reduce the risk of additional contamination release during the investigation and, by removing product encountered in the pipes, will serve as a source removal action in itself. Any product removed will be containerized for later testing and disposal by the waste disposal subcontractor.

Even after wet vacuuming product/fluid from the building piping, there will still be a potential for ignition of vapors within the piping during smoke testing. Therefore smoke testing will be performed by generating a smoke source above ground in a container and, via a small blower, pumping the smoke into the piping.

2.2.2 SUBTASK 2.2 Mobilization/Demobilization

This subtask includes all activities associated with mobilizing and demobilizing for the predesign field investigation, including field personnel orientation, equipment mobilization, identification of sample locations, and demobilization. Activities will need to be carefully coordinated to maintain efficiency and the project schedule. In addition to routine communication with subcontractors, EPA, CDM Federal staff, DPNR and others on the status and schedule of activities, CDM will prepare a critical-path management project schedule to coordinate activities, forecast critical path and identify corrective actions needed.

Equipment mobilization will entail the ordering and purchase of sampling equipment, drilling equipment, health and safety equipment and decontamination equipment. A decontamination station will be constructed for sampling equipment and a separate decontamination pad will be constructed by the drilling subcontractor for the drilling equipment. CDM Federal field equipment will be mobilized to the site in bulk shipment where it will be stored at a location agreed to by EPA and DPNR.

2.2.3 SUBTASK 2.3 Hydrogeological Assessment

One of the objectives of the predesign field investigation is to estimate the extent of DNAPLs in the saturated zone beneath the site and to make recommendations for integrated remediation with the other source control operations and the Tutu Wells Site groundwater remediation system. DNAPLs are very difficult to define and characterize in the subsurface environment. CDM Federal believes that intrusive investigation offers the best opportunity to meet the study objectives.

The hydrogeological assessment will be performed using an "inside-out" approach to define the DNAPL in the saturated zone. This type of approach minimizes the number of borings required as well as the time to complete the investigation. However, the inside-out approach can also increase the potential for rapid vertical migration of DNAPL. Drilling and testing processes have therefore been planned to reduce this potential.

The hydroassessment will be performed by extending five bedrock rock borings up to 75 feet in the saturated zone. Assuming 30 feet of unsaturated bedrock above the water table, the total depth of these borings is estimated at 105 feet. This boring depth is estimated for planning purposes. Final depths will be based on field observations and consultation with EPA. Figure 2 shows the proposed locations for the hydrogeological assessment borings. Borings H-1, H-2, H-3, H-4 and H-5 will be multi-purpose. These borings are referred to as deep borings. The unsaturated portion of the boring (the upper 30 feet approximately) will be tested as described in Subtasks 2.4 and 2.5. The lower (saturated) portion of the boring will be tested as follows for the hydrogeologic assessment.

To reduce the potential of rapid DNAPL migration, the unsaturated portion of these deep borings will be overbored, screened, cased, and grouted for conversion to SVE wells, as described in Subtasks 2.4 and 2.5. No bottom to the SVE well will be installed, thereby allowing further drilling in the same hole. The saturated fractured bedrock would be cored at 15-foot intervals using a 3-inch NX core barrel, packered, and pump tested for 30 minutes. A groundwater sample will be collected after the 30 minute test. This sample will be split. One split will be tested in a field lab using the shaker-dye test to identify free phase DNAPL. The remaining split of the sample will be laboratory analyzed for Target Compound List (TCL) VOCs, ferrous iron (Fe^{+2}), ferric iron (Fe^{+3}), total organic carbon (TOC). Sample pH will be analyzed in the field. Up to 25 groundwater samples will be collected, shaker-dye tested and laboratory analyzed.

If DNAPL is observed in the fractures of the cores obtained during drilling, the core sample will be containerized and submitted to the lab for extraction and analysis for TCL VOCs. If no DNAPL is observed, the cores will be containerized and headspace tested with an organic vapor meter (OVM) photoionization detector (PID) in the field. Up to three (3) core samples per boring will be sent to the lab for analysis. Each core will be visually examined to record fracture orientations, spacings and apertures.

After the completion of these borings, the saturated portion of the boring will be pressure grouted for closure. The unsaturated portions of the borings will be converted to SVE extraction test points and/or extraction wells. Note that the location of four of the five borings coincide with the locations selected in the Tutu Wells Site FS for SVE wells.

Based on the location and quantity of DNAPL encountered during this testing, CDM Federal will determine whether supplemental remedial technologies are appropriate to address the DNAPL in the saturated zone. If so, CDM Federal will prepare a technical memorandum to recommend any supplemental technologies. In addition, CDM Federal will assess the performance of the nearby Texaco Source Control system, as their results will relate to the DNAPL problem in the saturated zone at the Curriculum Center subsurface.

2.2.4 SUBTASK 2.4 Soil Boring and Drilling

This task relates specifically to drilling and soil boring sampling that will be performed for the predesign, both in the unsaturated and saturated zone.

Three types of soil boring/sampling procedures are planned: exterior borings, building borings, and deep borings. The exterior borings will be used to investigate the unsaturated zone outside the building. These borings will be drilled to four feet below the water table, or an estimated 34 feet below grade. The building borings will be used to investigate the subsurface contamination beneath the Curriculum Center building. The depth of these borings is limited by the available drilling technology that can operate from within the building without significant disturbance to the building. The deep borings will be drilled to test the top 75 feet of the saturated zone, as described in Subtask 2.3. The top portions of the deep borings, from the unsaturated zone, will be treated as additional exterior borings.

No separate surface soil investigation is planned. The borings have been located in the most likely areas to encounter contamination, either in the surface soils or subsurface bedrock, based on historical information. The uppermost samples collected from each boring will therefore be used to characterize the surface soils.

Exterior Borings

The location of 11 exterior borings are shown in Figure 2. These borings will be drilled and splitspoon/core sampled to the water table on 5-foot intervals for soil/rock. The samples will be screened in the field using an OVM PID and sent to the CLP laboratory for TCL VOC analysis. Up to 66 unsaturated zone samples from the 11 borings will be sent to the lab for analysis. Upon reaching the water table, each boring will be advanced into the saturated zone where one additional core sample and a groundwater sample will be collected. The groundwater sample will be screened in the field lab using a shaker-dye test for DNAPL and will be sent to the lab for analysis of TCL

VOCs to help identify nearby source areas of contamination. A total of 11 groundwater samples and 11 saturated soil/core samples will be collected.

Building Borings

The locations of five building borings are shown in Figure 2. These boring will be drilled by saw cutting the concrete slab building floor and advancing a portable drill unit to a depth up to 10 feet below grade. The depth that can be reached will be limited by the technology which can be operated within an active building without significant disruption or building demolition. Soil/rock fragments samples will be collected immediately below the slab and at five intervals thereafter. Up to 15 soil samples will be field screened with an OVM and sent for lab analysis of TCL VOCs.

Unsaturated Portion of Deep Borings

Similar to the exterior borings, the unsaturated portions of the five deep hydroassessment borings will be drilled and sampled on 5 foot intervals for soil/core fragments. These samples will be screened in the field using an OVM and sent to the laboratory for TCL VOC analysis. Up to 30 samples from the five deep borings will be sent to the lab for analysis. Sampling of the saturated portion of the deep borings is described under Subtask 2.3.

Vacuum Testing of Borings

The unsaturated portion of each of the five deep borings will undergo packer vacuum testing at three intervals. The intervals will be selected based on the field screening of soil/rock. Each vacuum test will include: flow rate monitoring at a constant vacuum, and soil gas concentration monitoring in the field with an OVM. Each packer test at each vacuum will be run for 15 minutes. A contingency has also been included to packer vacuum test up to two additional exterior borings in the same manner, should these borings locate significant quantities of contamination.

After evaluating the packer test data, up to five borings will be selected for 24-hour SVE testing. These five borings will be cased, screened and grouted as permanent SVE wells. Any borings not selected for conversion to SVE wells will be converted to nested pressure probes. Each nest will consist of three one-inch diameter pressure probes, located at different depths and isolated within the boring by grout. The borings within the building will also be converted to pressure probes that are flushed mounted within the floor. The pressure ports will be monitored using hand held manometers to determine the vertical and horizontal radius of influence of the individual SVE wells. The SVE wells and pressure probes will become part of the final remediation system. Off gas from the SVE testing would be treated on site using vapor phase carbon units.

These SVE wells will be step-vacuum tested individually for flow rate and subsurface radius of influence. In addition, grab samples of the influent stream vapor will be collected in SUMMA canisters and field screened with an OVM. The vapor samples will be collected every six hours during each test. Soil gas samples for lab analysis will be collected at Hour 1 and Hour 24 of each

SVE well test. A total of 10 samples will be collected using SUMMA canisters for laboratory analysis of VOCs according to EPA method TO-14.

As a contingency, the SVE test on one well may be extended up to 72 hours to better define the asymptotic shape of the influent concentration curve.

2.2.5 SUBTASK 2.5 Environmental Sampling

The rationale and approach for collecting environmental samples are discussed in Subtasks 2.3 and 2.4. The following samples of soil gas, soil/core fragments, and groundwater will be collected and analyzed under this subtask.

Media	Number of Samples
soil or rock core	126
soil gas	10
groundwater	36
waste oil/product (from pipes)	10

Soil or Rock Core

Soil/core samples will be collected from the following borings:

Type of Boring	Borings	Lab Samples	Lab Analyses
Deep - unsaturated	5	30	TCL VOCs
Deep - saturated	5	15	TCL VOCs
Exterior	11	66	TCL VOCs
Building	5	15	TCL VOCs

The uppermost intervals of the borings, if unconsolidated, will be considered surface soil samples. Assuming all borings encounter unconsolidated materials in the top one to four feet, 21 surface soil samples would be collected.

Groundwater Samples

Groundwater samples will be collected from the following borings:

Type of Boring	Borings	Lab Samples	Lab Analyses
Deep	5	15	TCL VOCs, TOC, Fe^{+2}/Fe^{+3}
Exterior	11	11	TCL VOCs

Soil Gas Samples

Five of the exterior soil borings will be converted to vertical vapor extraction wells. Each well will undergo venting tests for a period of 24 hours. Influent soil gas samples will be collected every six hours during the 24 hour test and field-analyzed with an OVM. A total of 10 soil gas samples will be sent to the lab for VOC analysis by method TO-14.

Waste Oil/Product

Some waste oil or product may be encountered during the wet vacuuming of the pipes within the Curriculum Center Building. If so, it will be contained for later hazardous waste characterization sampling and disposal by the waste removal subcontractor. However, upon encountering it, CDM Federal will collect samples of any such material and send it to a laboratory for full TCL/target analyte list (TAL) analysis. For planning purposes it is assumed that 10 waste oil/product samples will be collected for analysis.

2.2.6 SUBTASK 2.6 Geotechnical Survey

No geotechnical survey is planned for this work assignment.

2.2.7 SUBTASK 2.7 Disposal of Field-Generated Waste

Investigation-derived wastes (IDW) from the drilling, the environmental sampling events, and the piping investigation will be disposed of by a waste removal/disposal firm under subcontract to CDM Federal, in accordance with all applicable Territory and Federal requirements, including RCRA and Toxic Substance Control Act (TSCA) regulations.

Wastes generated during the RD, including drill cuttings, waste/solvent, and personal protective equipment (PPE) will be placed in Department of Transportation (DOT)-approved 55-gallon drums and stored on the Site for future testing and disposal. Drums will be labeled and stored on wooden pallets and covered with waterproof tarps.

CDM Federal will prepare a detailed scope of work as part of the process to procure a waste removal subcontractor.

2.2.8 SUBTASK 2.8 Subcontractor Procurement

This subtask will include the procurement and management of all subcontractors to complete the field investigation activities. To support the proposed field activities, the following subcontractors will be required:

- a USVI licensed driller to install the borings inside and outside the Curriculum Center building, install the SVE wells, and perform packer testing;
- a USVI licensed surveyor to survey the site and boring locations;
- a laboratory to analyze soil samples, rock samples, vapor samples, waste oil and product samples;
- a waste removal and disposal contractor; and
- a vendor to provide vapor-phase activated carbon treatment canisters.

All subcontractor procurement packages will be subject to a quality assurance and technical review.

2.3 TASK 3 - SAMPLE ANALYSIS / DATA VALIDATION

As described in Section 2.2, several different types of analytical work will be required for the predesign investigation:

- Analysis of soil and rock for TCL VOCs;
- Analysis of groundwater for DNAPL and VOCs, TOC, Fe^{+2}/Fe^{+3};
- Analysis of influent soil gas concentration during the 24-hour SVE tests for VOCs;
- Analysis of waste oil/product found in pipes beneath building for full TCL/TAL parameters; and
- RCRA waste characterization analysis (TCLP, ignitability, corrosivity, reactivity). to determine disposal requirements for investigation derived waste. (This testing will be performed by the waste disposal subcontractor).

CDM Federal will utilize EPA's CLP laboratories for analysis of TCL VOCs in environmental samples. A subcontractor laboratory will be solicited to analyze TOC, Fe^{+2}/Fe^{+3} in groundwater; waste oil/product samples; DNAPL; and vapor samples.

2.3.1 SUBTASK 3.1 - Sample Management

The CDM Federal Analytical Services Coordinator will be responsible for all CLP and non-CLP laboratory bookings and coordination with the Regional Sample Control Center (RSCC) for sample tracking prior to and after sampling events. Sample management activities will include:

- Preparation of sample projections;
- Request for analytical services in accordance with procedures outlined in the Users Guide to the Contract Laboratory Program, December, 1986;
- Coordination with the EPA Contract Laboratory Analytical Support Services (CLASS); and
- Sample tracking.

For all routine analytical services (RAS) activities, CDM Federal will notify the CLASS representative to enable them to track the shipment of samples from the field to the laboratories and to ensure timely laboratory receipt of samples. Sampling Trip Reports will be sent directly to the RSCC, to CLASS, and the EPA Remedial Project Manager within ten working days of final sample shipment, with a copy sent to the CDM Federal Analytical Services Coordinator.

2.3.2 SUBTASK 3.2 - Data Validation

Because the intended use of the sample data is for engineering and design purposes, validated analytical data is not required for this work assignment.

2.4 TASK 4 - DATA EVALUATION

This task includes work efforts related to the compilation and interpretation of all pre-design analytical and field data. The data will be entered into a computer data base and will be utilized in the preparation of the predesign report tables, maps and figures.

2.4.1 SUBTASK 4.1 - Data Evaluation of Predesign Field Results

The CDM Federal design engineers will evaluate the data obtained during the predesign investigations to determine the ultimate design parameters for the SVE wells and any excavation of surface soils that is determined to be necessary. The data to be evaluated in this task include:

- Soil boring logs
- Field sampling data
- SVE vacuum test results
- Analytical results (soils/rock, vapor, groundwater, and product)

CDM Federal will use an appropriate database program and standard industry spreadsheet software programs for managing all data related to the sampling program. The system will provide data storage, retrieval, and analysis capabilities, and be able to interface with a variety of spreadsheet, word processing, statistical, and graphics software packages. New and existing data will be organized, formatted, and input into the database for data evaluation. Data tables comparing the results of the various phases of sampling efforts will be prepared and evaluated. Analytical data

results will interface with graphics packages to illustrate contaminant distribution, SVE well capture zones, soil pressure distributions, etc.

2.4.2 SUBTASK 4.2 - Data Mapping

The predesign data will be posted on site basemaps for the predesign reports. Figures will be generated in plan view and cross section to show the extent of VOC and DNAPL contamination, if any, in the unsaturated zone and below the water table; and the radius of influence of the SVE wells. Three-dimensional fence diagrams of the fractured bedrock will be prepared to summarize fracture density, orientation, and potential connectivity.

2.5 TASK 5 PREDESIGN REPORT

2.5.1 SUBTASK 5.1 - Draft Predesign Report

The results of the predesign investigations will be compiled and interpreted in a Predesign Report for EPA. The report will provide the site-specific design parameters needed to begin the design phase of this assignment. If appropriate, recommendations for integrated treatment of DNAPL in the unsaturated and saturated zones will be included in the report.

2.5.2 SUBTASK 5.2 - Final Predesign Report

Following receipt of comments from EPA on the Draft Predesign report, CDM Federal will revise the document and submit a Final Predesign Report.

2.6 TASK 6 REMEDIAL DESIGN

CDM Federal will conduct the design of the soil remediation for the Curriculum Center as outlined in the ROD. This design will include the preparation of a Preliminary (30% completion) Design, a Pre-Final (95% completion) Design, and a Final (100% completion) Design. The Preliminary Design will include a Basis of Design Report, drawings, and performance-based specifications. The Pre-Final and Final Designs will include drawings and performance-based specifications. CDM Federal will also prepare an Engineer's Cost Estimate. A Draft Operation and Maintenance (O&M) Manual will be prepared by the selected remedial action contractor.

2.6.1 SUBTASK 6.1 - Preliminary (30% Completion) Design

The preliminary RD Report will include the conceptual plans and specifications that have been developed at that point in time along with a design analysis. The design analysis will provide the rationale for the plans and specifications, including supporting calculations and documentation of how the plans and specifications will meet the requirements of the ROD. The Basis of Design

Report will include the following items (to the extent that work has been performed regarding the items), as appropriate:

I A discussion of the manner in which the Remedial Action will achieve the Performance Standards;

ii A plan for establishing institutional controls (*i.e.*, deed restrictions and/or other similar land use restrictions);

iii Preliminary drawings and process diagrams showing general arrangement of all work proposed;

iv Table of Contents for the specifications, including a listing of items from the Construction Specifications Institute master format that are expected to be included in the construction specifications;

v Engineering plans representing an accurate identification of existing Site conditions and an illustration of the work proposed. Typical items to be provided (in full or partially) on such drawings include, at a minimum, the following:

1. Title sheet, including at least the title of the project, a key map, the name of the designer, date prepared, sheet index, and EPA project identification;

2. All property data, including owners of record for all properties within 200 feet of the Site;

3. A Site survey including the distance and bearing of all property lines that identify and define the project Site;

4. All easements, rights-of-way, and reservations;

5. All buildings, structures, wells, facilities, and equipment (existing and proposed), if any;

6. A topographic survey will be presented in intervals that clearly depict the Site topography, including existing and proposed contours and spot elevations for all areas that will be affected by the remedial activities, based on U.S. Coast and Geodetic Survey data;

7. All utilities, existing and proposed;

8. Site security measures;

9. Roadways;

10. Electrical, mechanical, structural, and HVAC drawings, if required.

11. Location and identification of all significant natural features including, *inter alia*, wooded areas, water courses, wetlands, flood hazard areas, and depressions;

12. North arrow, scale, sheet numbers and the person responsible for preparing each sheet;

13. Decontamination areas, staging areas, borrow areas and stockpiling areas;

vi Survey work that is appropriately marked, recorded and interpreted for mapping, property easements and design completion;

vii Drawings of all proposed equipment, improvements, details and all other items to be developed in accordance with the current standards and guidelines. Drawings will be of standard size, approximately 24" x 36". A list of drawing sheet titles will be provided; and

viii Any value engineering proposals.

2.6.2 SUBTASK 6.2 - Pre-Final (95% Completion) Design

The Pre-Final Remedial Design will include, as appropriate:

I Pre-Final plans and specifications;

ii A Draft Construction Quality Assurance Project Plan (CQAPP) for sampling, analysis, testing, and monitoring to be performed during the Remedial Action phase of the work. Quality assurance items to be addressed will include the following:

1. Inspection and certification of the work;
2. Measurement and daily logging;
3. Field performance and testing;
4. As-built drawings and logs;
5. Testing of the work to establish whether the design specifications are attained; and

6. Testing methods appropriate to Remedial Construction including testing of Remedial Construction materials prior to use, and testing of constructed remedial components to determine if they meet design specifications.

iii An engineer's construction cost estimate, which may be provided under separate cover concurrent with submittal of the Final Design.

2.6.3 SUBTASK 6.3 - Final (100% Completion) Design

Comments on the Pre-Final (95% completion) Design will be addressed in the Final (100% Completion) Design, after EPA's review and approval.

2.7 TASK 7 NEGOTIATIONS SUPPORT

This task includes all efforts to support Remedial Action negotiations with the potentially responsible parties (PRPs). For planning purposes, EPA has directed CDM Federal to assume the following support will be provided:

- Attend three negotiation sessions with EPA in the USVI;
- Review up to two technical documents from each of three Potentially Responsible Parties (6 documents);
- Prepare up to two Technical Memoranda concerning each of the three PRPs (6 technical memoranda).
- Provide other technical assistance to EPA, as requested.

2.8 TASK 8 COMMUNITY RELATIONS SUPPORT

This task includes work efforts to implement a community relations program for the remedial design phase at the Site. Implementation of community relations activities will enable EPA, the Territory and others contributing to remedial response efforts to continue to inform the public of planned and ongoing actions and focus and resolve controversy. Furthermore, implementation of community relations must be integrated with all technical response activities. The following activities are to be conducted as part of the community relations support for the Site:

2.8.1 SUBTASK 8.1 - Revise Existing Community Relations Plan

CDM Federal will revise the Community Relations Plan from work assignment 073-2P1D as appropriate, to indicate the current status of the Site, the upcoming remedial design, and EPA's plans to keep the community informed about the process.

2.8.2 SUBTASK 8.2 - Public Availability Meetings Support

CDM Federal will provide community relations support to EPA for two Public Availability Meetings to update the community of the status of the RD and to answer community questions. Activities that will be performed under this task include:

- Preparation, print and distribution of flyers, posters and public notices announcing EPA's meetings in the Tutu area;
- Coordination of the meeting place logistics, preparing slides, exhibits, and other audio-visual materials;
- Maintenance of the mailing lists; and
- Maintenance of the offsite repository.

2.8.3 SUBTASK 8.3 - Fact Sheets

CDM Federal will prepare and distribute two (2-page) fact sheets during the RD process to provide the local residents with information about the site. Topics for the fact sheets include, but are not limited to: summary information on the site history, the status of the RD, and the schedule of predesign field work.

3.0 PROJECT ORGANIZATION

The CDM Federal project team for this work assignment consists of the following key staff:

ARCS Program Manager
Robert Goltz, P.E.

Work Assignment Manager
Drew Bennett

Project Design Engineer
Demetrios Klerides, P.E.

Predesign Leader
Drew Bennett

Field Operations Leader
Michael Valentino, P.G.

Regional Quality Assurance Coordinator
Susan Flakus

Analytical Services Coordinator
Scott Kirchner

4.0 PROJECT SCHEDULE

The project schedule for the RD is shown in Figure 3. The schedule for this project is based on assumptions for durations and conditions of key events occurring on the critical and non-critical path. These assumptions are as follows:

- Field activities will not be significantly delayed due to adverse weather conditions.
- The schedule for the field activities is dependent on access to the Curriculum Center facility being obtained without difficulty.
- The schedule is dependent on timely review and approval of the Work Plan, Quality Assurance Project Plan, and other project design documents by EPA and the USVI.

REFERENCES

Arthur D. Little, Inc., 1994. Environmental Investigation Report, Tutu Area, St. Thomas, U.S. Virgin Islands, Revised February 16, 1994.

Geraghty & Miller, Inc., 1995. Final Phase II Remedial Investigation, Tutu Wells Site, St. Thomas, U.S. Virgin Islands. Prepared for the Tutu Environmental Investigation Committee.

Geraghty & Miller, Inc., 1995, Final Feasibility Study, Tutu Wells Site, St. Thomas, U.S. Virgin Islands. Prepared for the Tutu Environmental Investigation Committee.

U.S. Environmental Protection Agency, 1989. Region II CERCLA Quality Assurance Manual.

U.S. Environmental Protection Agency, 1990. Guidance on Expediting Remedial Design and Remedial Action. Office of Emergency and Remedial Response, Washington, DC 20460. EPA 540/G-90/006, August 1990.

U.S. Environmental Protection Agency, 1995, Guidance for Scoping the Remedial Design. Office of Solid Waste and Emergency Response, Washington, DC 20460. EPA 540/R-95/025, March 1995.

U.S. Environmental Protection Agency, 1995, Remedial Design/Remedial Action Handbook. Office of Emergency and Remedial Response, Washington, DC 20460. EPA 540/R-95/059, June 1995.

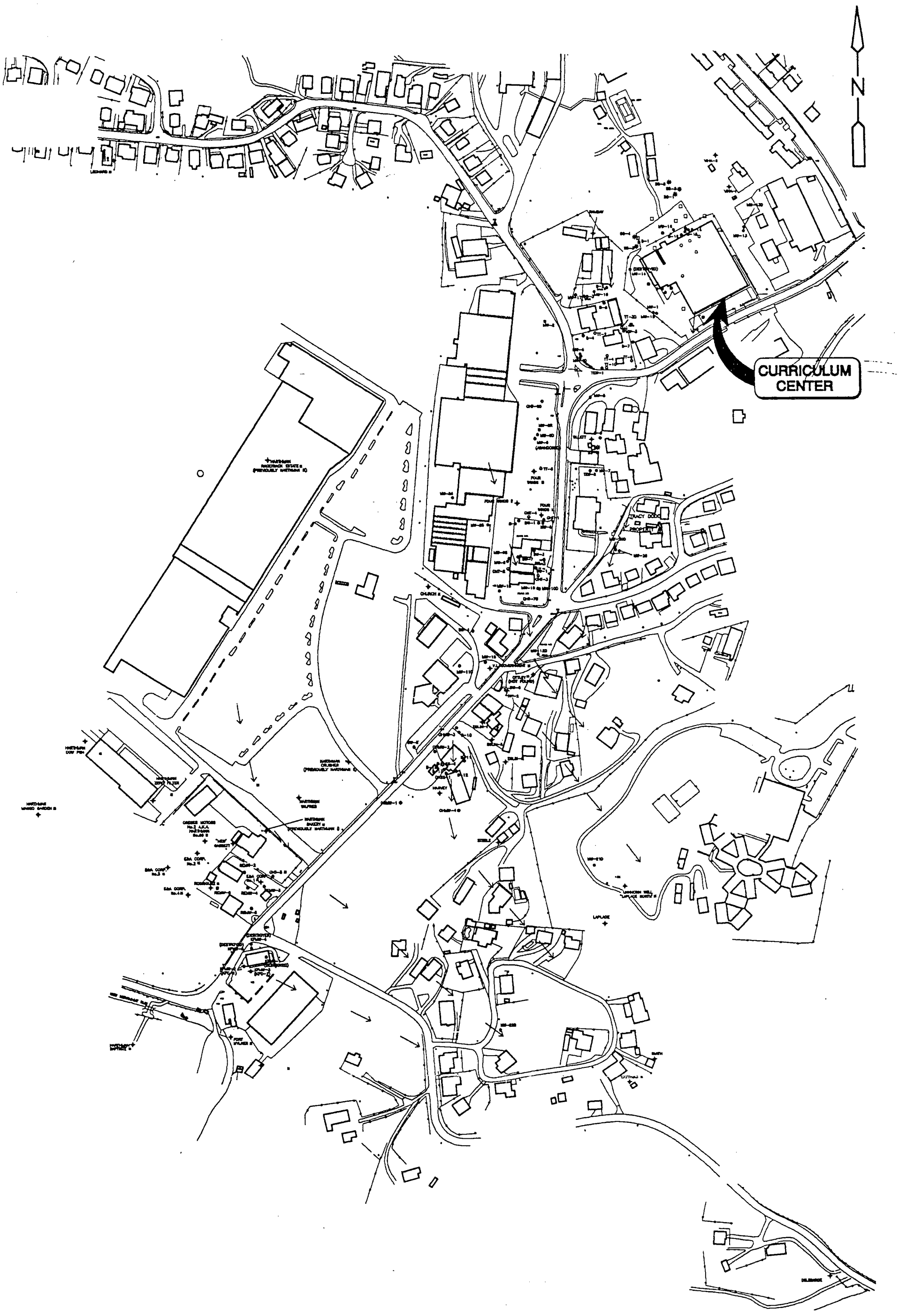
U.S. Environmental Protection Agency, 1996, Record of Decision, Tutu Wellfield Site, Anna's Retreat, St. Thomas, U.S. Virgin Islands. USEPA, Region II, New York, July 1996.

Table 1
Project Deliverables and Due Dates

Design for
Soil Remediation at Curriculum Center

TASK	DELIVERABLE	DUE DATE*
1.1	Draft RD Work Plan	30 days after scoping meeting
1.1	Final RD Work Plan	15 days after receipt of EPA comments
1.3	Draft Quality Assurance Project Plan (QAPP, SMP, HSP)	30 days after approval of RD work plan
1.3	Final Quality Assurance Project Plan	15 days after receipt of EPA comments
5.1	Draft Predesign Report	45 days after receipt of all analytical data
5.2	Final Predesign Report	15 days after receipt of EPA comments
6.1	Basis of Design Report and Preliminary (30%) Plans and Specifications	60 days after Predesign report approved
6.2	Pre-final (95%) Plans and Specifications	60 days after Preliminary (30%) Design approved
6.3	Final (100%) Design	21 days after Pre-final comments received
8.1	Draft Revised Community Relations Plan	30 days after approval of RD work Plan
8.1	Final Revised CRP	15 days after receipt of EPA comments

* Contingent upon receipt of EPA authorization to initiate task.



SOURCE: GERAGHTY & MILLER, INC.
ENVIRONMENTAL SOLUTIONS

CDM Federal Programs Corporation
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Figure No. 1
Curriculum Center Location At Tutu Wells Site
Soil Remediation Design at the Cirriculum Center
Tutu Wells Site, St. Thomas, USVI

Robert Gencarelli
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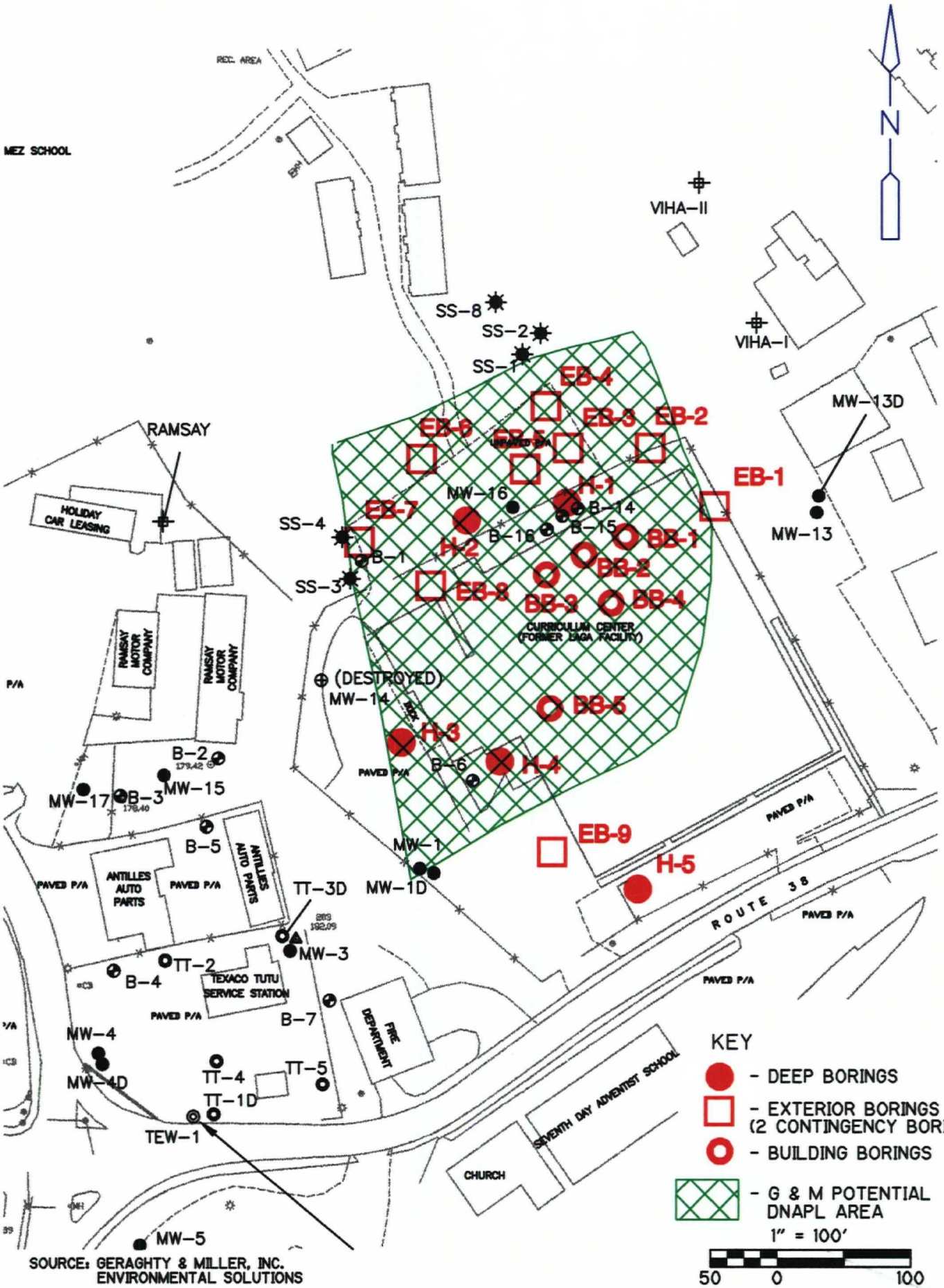

SOURCE: GERAGHTY & MILLER, INC.
ENVIRONMENTAL SOLUTIONS

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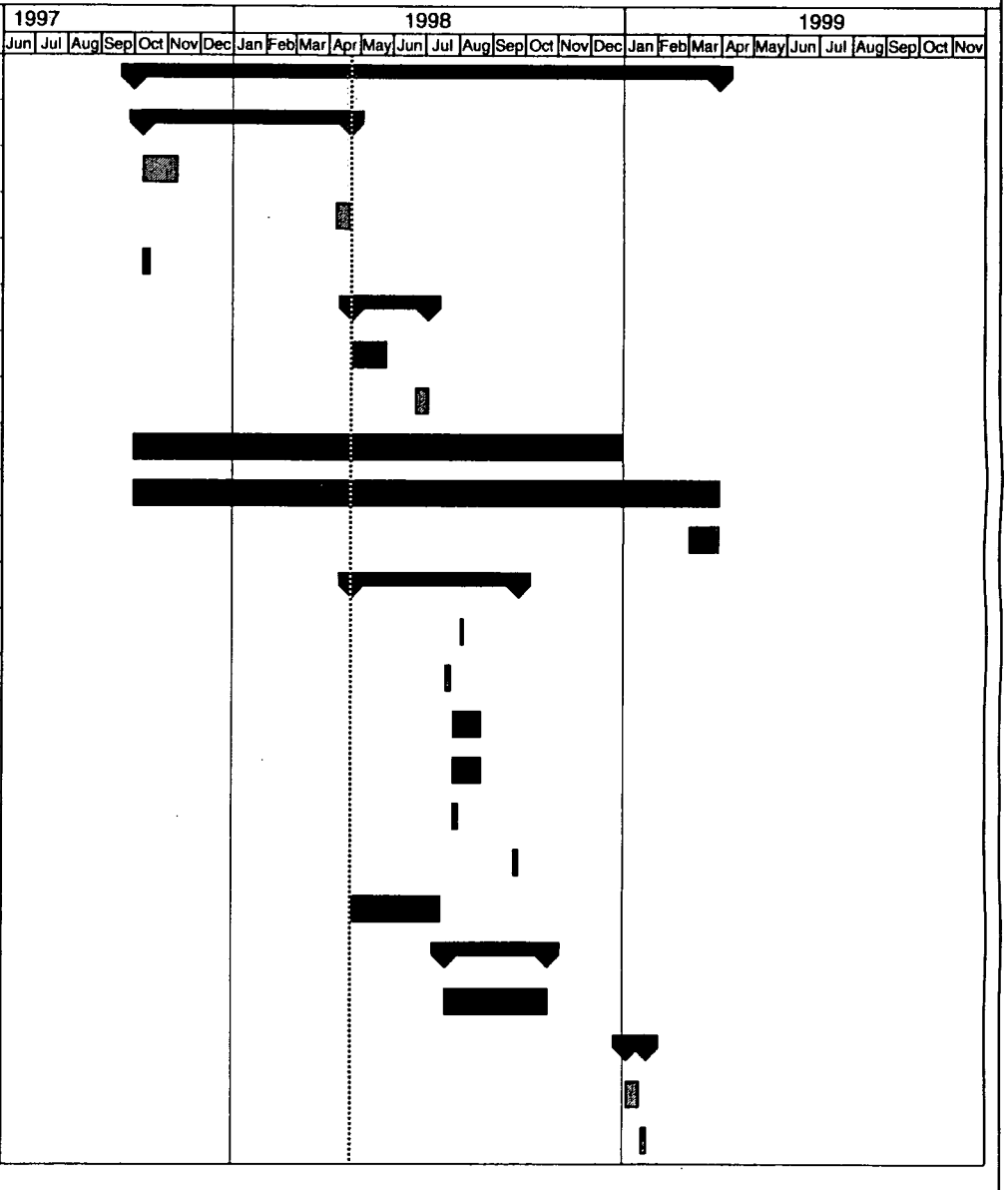
Figure No. 2
Location Of Proposed SVE Pilot Test And Sample Locations
Soil Remediation Design at the Curriculum Center
Tutu Wells Site, St. Thomas, USVI

Robert Gancorelli 2:27:07 11/05/97 13:16:13 S:\4720\22393\SOIL\FIG2

Tutu Wells Site - Remediation of Soils at the Curriculum Center

ID	Name	Duration	Scheduled Start	Scheduled Finish
1	1.0 Project Planning	390d	10/1/97	3/30/99
2	WorkPlan Preparation	140d	10/9/97	4/22/98
3	Draft Work Plan	4.5w	10/9/97	11/10/97
4	Final Work Plan	2.2w	4/8/98	4/22/98
5	Review Background Documents	1w	10/9/97	10/15/97
6	Quality Assurance Project Plan	52d	4/23/98	7/3/98
7	Draft QAPP	4.5w	4/23/98	5/25/98
8	Final QAPP	2w	6/22/98	7/3/98
9	Quality Assurance	65w	10/1/97	12/29/98
10	Project Administration	78w	10/1/97	3/30/99
11	Project Closeout	4w	3/3/99	3/30/99
12	2.0 Pre-Design Field Investigation	112d	4/23/98	9/25/98
13	Site Reconnaissance	3d	8/3/98	8/5/98
14	Mobilization	1w	7/20/98	7/24/98
15	Soil Boring and Drilling	4w	7/27/98	8/21/98
16	Environmental Sampling	4w	7/27/98	8/21/98
17	Geotechnical Survey	1w	7/27/98	7/31/98
18	Disposal of IDW	1w	9/21/98	9/25/98
19	Subcontractor Procurement	12w	4/23/98	7/15/98
20	3.0 Sample Analysis/DV	70d	7/20/98	10/23/98
21	Sample Management	14w	7/20/98	10/23/98
22	4.0 Data Evaluation	15d	1/4/99	1/22/99
23	Eval Pre-Design Field Results	2w	1/4/99	1/15/99
24	Data Mapping	1w	1/18/99	1/22/99



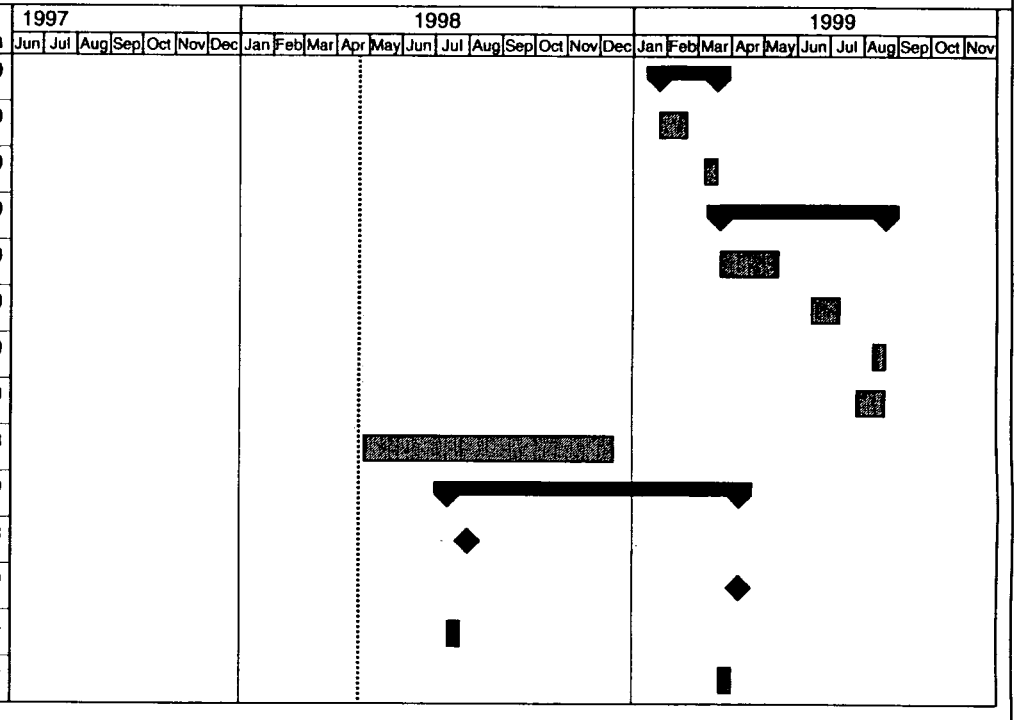
Project: 089-2R1D
Date: 4/21/98

Critical
Noncritical
Progress
Milestone
Summary
Rolled Up

Figure 3

Tutu Wells Site - Remediation of Soils at the Curriculum Center

ID	Name	Duration	Scheduled Start	Scheduled Finish
25	5.0 Pre-Design Report	40d	1/25/99	3/19/99
26	Draft Pre-Design Report	4w	1/25/99	2/19/99
27	Final Pre-Design Report	2w	3/8/99	3/19/99
28	9.0 Remedial Design Report	110d	3/22/99	8/20/99
29	Preliminary RD (30%) Report	8w	3/22/99	5/14/99
30	Pre-Final RD (95%) Report	4w	6/14/99	7/9/99
31	Final RD (100%) Report	2w	8/9/99	8/20/99
32	Draft O&M Manual	4w	7/26/99	8/20/99
33	10.0 Negotiations Support	166d	4/27/98	12/14/98
34	11.0 Community Relations Support	195d	7/13/98	4/9/99
35	Public Availability Meeting 1	0d	7/31/98	7/31/98
36	Public Availability Meeting 2	0d	4/9/99	4/9/99
37	Fact Sheet 1	2w	7/13/98	7/24/98
38	Fact Sheet 2	2w	3/22/99	4/2/99



Project: 089-2R1D
Date: 4/21/98

Critical
Noncritical
Progress
Milestone
Summary
Rolled Up

Figure 3

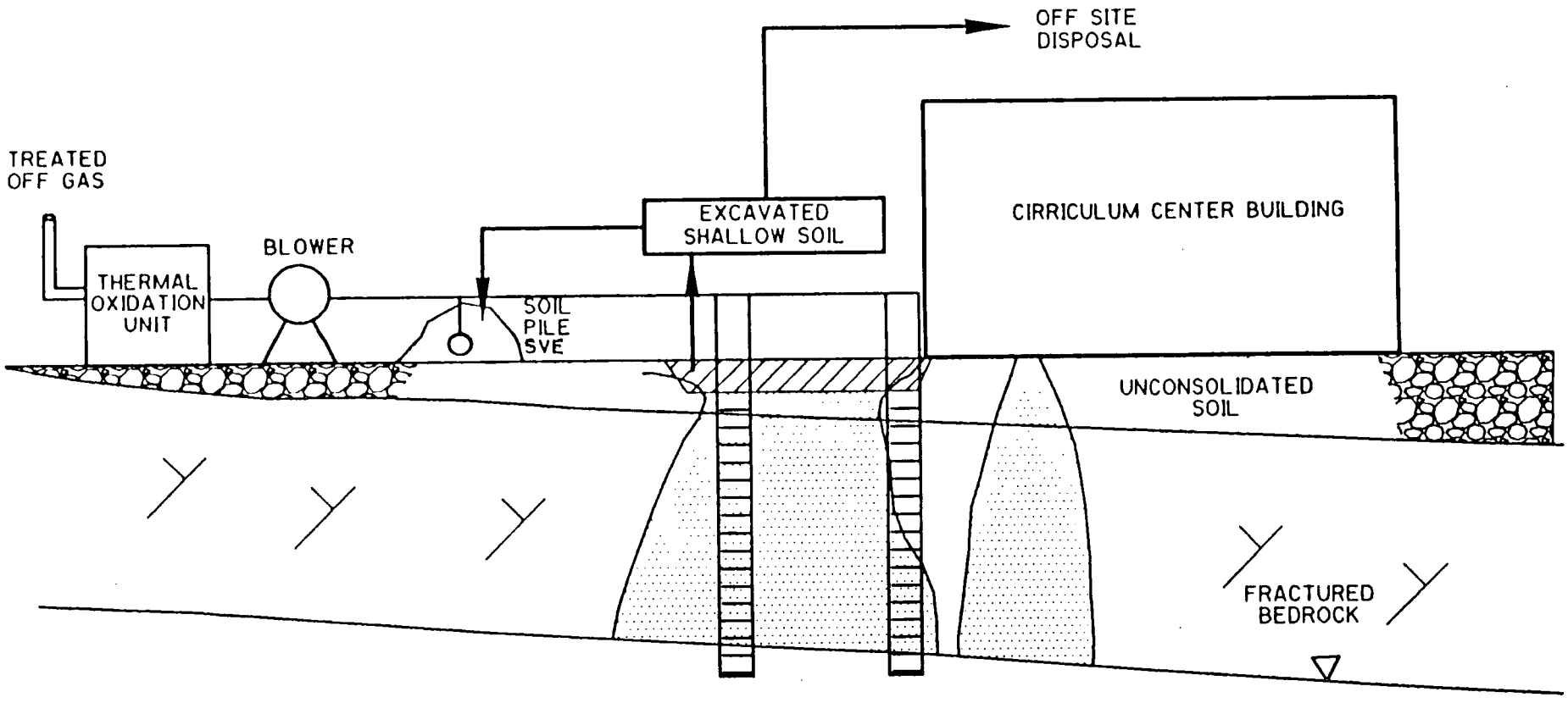


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Figure No. 4

Conceptual Soil Remediation Process Schematic

Soil Remediation Design at the Cirriculum Center
Tutu Wells Site, St. Thomas, USVI